

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

CARL B. COLLINS and
FARZIN DAVANLOO,
Plaintiffs,

v.

NISSAN NORTH AMERICA, INC. and
NISSAN MOTOR CO., LTD.,
Defendants.

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CASE NO. 2:11-CV-428-JRG

MEMORANDUM OPINION AND ORDER

Before the Court is Plaintiffs Carl B. Collins and Farzin Davanloo's Opening *Markman* Brief Pursuant to P.R. 4-5(a) (Dkt. No. 58). Also before the Court are Defendants Nissan North America, Inc. and Nissan Motor Co., Ltd.'s response (Dkt. No. 63) and Plaintiffs' reply (Dkt. No. 64). The Court held a claim construction hearing on January 30, 2013.

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I. BACKGROUND

Plaintiffs assert United States Patents No. 5,411,797 (“the ‘797 Patent”) and 5,478,650 (“the ‘650 Patent”) (collectively, “the patents-in-suit”), both titled “Nanophase Diamond Films.” The ‘650 Patent is a divisional of the ‘797 Patent, so the patents-in-suit share a common specification. The patents-in-suit were construed by Judge T. John Ward of this Court in *Carl B. Collins, et al. v. The Gillette Company*, No. 2:04-CV-38, Dkt. No. 79 (E.D. Tex. June 22, 2005) (“*Gillette*”), and again in *Carl B. Collins, et al. v. Western Digital Technologies, Inc., et al.*, No. 2:09-CV-219, Dkt. No. 383 (E.D. Tex. Sept. 22, 2011) (“*Western Digital*”).¹

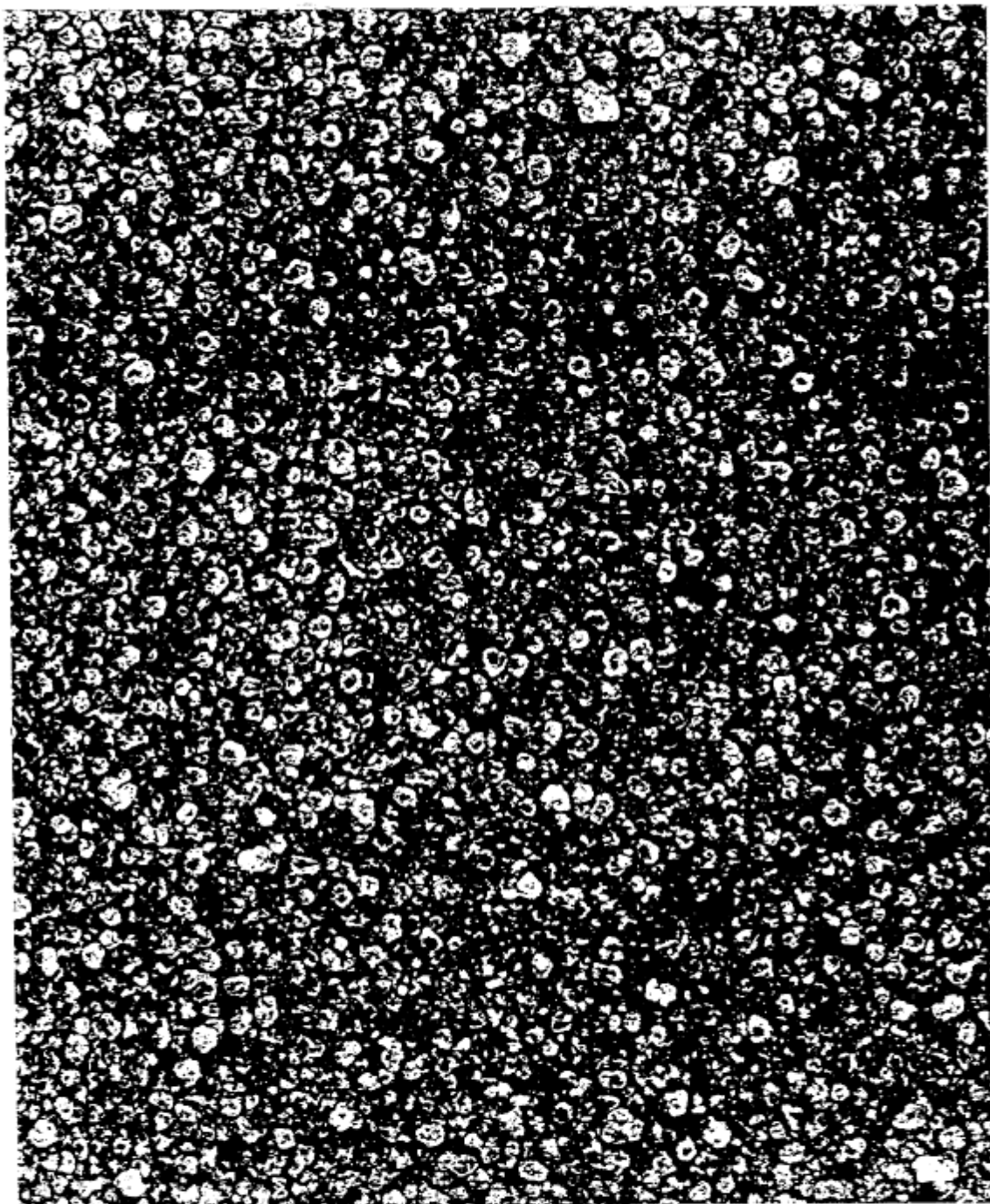
Diamond is composed of carbon atoms. Another common form of carbon is graphite. The differences between diamond and graphite are caused by differences in bonding between the carbon atoms that make up each material. Graphite is composed primarily or entirely of “sp²” bonds, which the parties characterize as two-dimensional bonds. Natural diamond is composed primarily or entirely of “sp³” bonds, which the parties characterize as three-dimensional bonds. These three-dimensional sp³ bonds are associated with diamond’s special properties, in particular hardness, wear resistance, high thermal conductivity, and high electrical resistivity.

The patents-in-suit disclose “diamond-like carbon” (“DLC”) coatings, which are formed by depositing carbon atoms onto a substrate. DLC coatings are useful for improving the wear resistance of mechanical structures, for example, razor blades (such as the accused products in *Gillette*), hard disk drive components (such as the accused products in *Western Digital*), and automotive engine components (such as the accused products in the present case).

¹ *Gillette* and *Western Digital* are attached to Plaintiffs’ opening brief in the above-captioned case as Exs. C-1 and C-2, respectively.

To form a DLC film, carbon ions are deposited onto a substrate in a manner that predominantly forms sp^3 bonds. Such a carbon coating can have diamond-like properties, such as hardness, wear resistance, thermal conductivity, electrical resistivity, and optical transparency. The “laser ablation” technique disclosed in the patents-in-suit produces a film with so-called “nodules” of sp^3 -bonded carbon, which purportedly contribute to desirable properties such as high optical quality, low coefficient of friction, and low internal stress. (*See, e.g.*, ‘797 Patent at Abstract.) The patents-in-suit also explain techniques for preventing macroscopic graphite particles from being deposited onto the substrate. (*See id.* at 5:66-6:12 & 10:6-34.) The patents-in-suit state that the prior art techniques of chemical vapor deposition and sputter deposition produce diamond-like films of inferior quality and that the prior art technique of ion beam deposition produces films at too low of a rate to be commercially useful. (*See id.* at 2:34-3:17.)

The patents-in-suit explain that the formation of predominantly sp^3 -bonded “nodules” provides desirable diamond-like properties without the brittleness that would otherwise be associated with a highly sp^3 -bonded carbon film. (*See id.* at 15:15-29.) Between the nodules lie voids, sp^2 -bonded carbon (graphite), or both. (*See id.* at 4:42-43 & 7:11-22.) The arrangement of nodules is analogous to a cobblestone street (*see* Dkt. No. 63, Ex. C-12, 12/6/2011 Collins dep., at 177:18-178:25) and, according to the written description, is shown in Figure 6 of the patents-in-suit. (‘797 Patent at 12:41-43.) The Summary of the Invention further discloses that “[t]ypically, these nodules range in size from 100 to 1000 angstroms [(10 to 100 nanometers)] in diameter” (*Id.* at 4:27-31.) Figure 6 indicates its scale by labeling a length of “0.2 μm ,” which is 0.2 micrometers and which is equal to 200 nanometers. Figure 6 is reproduced here:



$0.2\ \mu\text{m}$

Fig. 6

The Abstracts of the patents-in-suit are the same and state:

Films of nanometer-scale nodules of diamond-bonded carbon structures are disclosed. Such films may be used, for example, to coat objects to improve their resistance to wear. Moreover, because the nanophase diamond films of the present invention are of optical quality, they may be used to coat optical lenses and the like. The nanophase diamond films of the present invention have diamond-like properties, indicating a preponderance of sp^3 bonds within the nodules and a substantial absence of hydrogen and graphite within the nodules. If desired, the nanophase diamond films disclosed herein may be created to have a hardness exceeding that of natural diamond, depending on the quantity of graphite left in the voids between the nodules. The nanophase diamond films of the present invention are also characterized by a low coefficient of friction, by low average internal stress, and by an optical quality capable of providing a visual appearance of Newton's rings of interference.

The parties dispute four terms contained in Claims 1, 2, and 4 of the '797 Patent and Claims 1, 2, and 4 of the '650 Patent. Claims 1 and 4 of the '797 Patent are representative and recite (disputed terms italicized):

1. A *nanophase diamond film*, comprising *nodules* of carbon bonded *predominantly in three dimensional sp^3 bonds*, said film comprising less than about 20% hydrogen, having an imaginary index of refraction less than 0.5 for a light wavelength of about 632.8 nm, and said nodules having a diameter of less than about 500 angstroms.

* * *

4. The nanophase diamond film of claim 1, wherein said film has an *optical quality capable of providing a visual appearance of Newtons' [sic] rings of interference*.

II. LEGAL PRINCIPLES

It is understood that "[a] claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using or selling the protected invention." *Burke, Inc. v. Bruno Indep. Living Aids, Inc.*, 183 F.3d 1334, 1340 (Fed. Cir. 1999). Claim construction is clearly an issue of law for the court to decide. *Markman v.*

Westview Instruments, Inc., 52 F.3d 967, 970-71 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996).

To ascertain the meaning of claims, courts look to three primary sources: the claims, the specification, and the prosecution history. *Markman*, 52 F.3d at 979. The specification must contain a written description of the invention that enables one of ordinary skill in the art to make and use the invention. *Id.* A patent's claims must be read in view of the specification, of which they are a part. *Id.* For claim construction purposes, the description may act as a sort of dictionary, which explains the invention and may define terms used in the claims. *Id.* "One purpose for examining the specification is to determine if the patentee has limited the scope of the claims." *Watts v. XL Sys., Inc.*, 232 F.3d 877, 882 (Fed. Cir. 2000).

Nonetheless, it is the function of the claims, not the specification, to set forth the limits of the patentee's invention. Otherwise, there would be no need for claims. *SRI Int'l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc). The patentee is free to be his own lexicographer, but any special definition given to a word must be clearly set forth in the specification. *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1388 (Fed. Cir. 1992). Although the specification may indicate that certain embodiments are preferred, particular embodiments appearing in the specification will not be read into the claims when the claim language is broader than the embodiments. *Electro Med. Sys., S.A. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 1054 (Fed. Cir. 1994).

This Court's claim construction analysis is substantially guided by the Federal Circuit's decision in *Phillips v. AWH Corporation*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). In *Phillips*, the court set forth several guideposts that courts should follow when construing claims. In

particular, the court reiterated that “the claims of a patent define the invention to which the patentee is entitled the right to exclude.” 415 F.3d at 1312 (emphasis added) (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). To that end, the words used in a claim are generally given their ordinary and customary meaning. *Id.* The ordinary and customary meaning of a claim term “is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Id.* at 1313. This principle of patent law flows naturally from the recognition that inventors are usually persons who are skilled in the field of the invention and that patents are addressed to, and intended to be read by, others skilled in the particular art. *Id.*

Despite the importance of claim terms, *Phillips* made clear that “the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.* Although the claims themselves may provide guidance as to the meaning of particular terms, those terms are part of “a fully integrated written instrument.” *Id.* at 1315 (quoting *Markman*, 52 F.3d at 978). Thus, the *Phillips* court emphasized the specification as being the primary basis for construing the claims. *Id.* at 1314-17. As the Supreme Court stated long ago, “in case of doubt or ambiguity it is proper in all cases to refer back to the descriptive portions of the specification to aid in solving the doubt or in ascertaining the true intent and meaning of the language employed in the claims.” *Bates v. Coe*, 98 U.S. 31, 38 (1878). In addressing the role of the specification, the *Phillips* court quoted with approval its earlier

observations from *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998):

Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.

Phillips, 415 F.3d at 1316. Consequently, *Phillips* emphasized the important role the specification plays in the claim construction process.

The prosecution history also continues to play an important role in claim interpretation. Like the specification, the prosecution history helps to demonstrate how the inventor and the Patent and Trademark Office (“PTO”) understood the patent. *Id.* at 1317. Because the file history, however, “represents an ongoing negotiation between the PTO and the applicant,” it may lack the clarity of the specification and thus be less useful in claim construction proceedings. *Id.* Nevertheless, the prosecution history is intrinsic evidence that is relevant to the determination of how the inventor understood the invention and whether the inventor limited the invention during prosecution by narrowing the scope of the claims. *Id.*; see *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1350 (Fed. Cir. 2004) (noting that “a patentee’s statements during prosecution, whether relied on by the examiner or not, are relevant to claim interpretation”).

Phillips rejected any claim construction approach that sacrificed the intrinsic record in favor of extrinsic evidence, such as dictionary definitions or expert testimony. The *en banc* court condemned the suggestion made by *Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193 (Fed. Cir. 2002), that a court should discern the ordinary meaning of the claim terms (through dictionaries or otherwise) before resorting to the specification for certain limited purposes.

Phillips, 415 F.3d at 1319-24. According to *Phillips*, reliance on dictionary definitions at the expense of the specification had the effect of “focus[ing] the inquiry on the abstract meaning of words rather than on the meaning of claim terms within the context of the patent.” *Id.* at 1321. *Phillips* emphasized that the patent system is based on the proposition that the claims cover only the invented subject matter. *Id.*

Phillips does not preclude all uses of dictionaries in claim construction proceedings. Instead, the court assigned dictionaries a role subordinate to the intrinsic record. In doing so, the court emphasized that claim construction issues are not resolved by any magic formula. The court did not impose any particular sequence of steps for a court to follow when it considers disputed claim language. *Id.* at 1323-25. Rather, *Phillips* held that a court must attach the appropriate weight to the intrinsic sources offered in support of a proposed claim construction, bearing in mind the general rule that the claims measure the scope of the patent grant.

In general, prior claim construction proceedings involving the same patents-in-suit are “entitled to reasoned deference under the broad principals of *stare decisis* and the goals articulated by the Supreme Court in *Markman*, even though *stare decisis* may not be applicable *per se*.” *Maurice Mitchell Innovations, LP v. Intel Corp.*, No. 2:04-CV-450, 2006 WL 1751779, at *4 (E.D. Tex. June 21, 2006).

III. CONSTRUCTION OF AGREED TERMS

The parties have agreed upon the following constructions:

<u>Term</u>	<u>Agreed Construction</u>
20% hydrogen (‘797 Patent and ‘650 Patent)	This term should be construed as it was agreed upon between the parties in <i>Gillette</i> and <i>Western Digital</i> : “20 atomic % hydrogen”
“said film is chemically bonded with a substrate” (‘650 Patent)	This term should be construed as it was in <i>Gillette</i> and <i>Western Digital</i> : “A chemical bond (i.e., the attractive force that holds together atoms in molecules and crystalline salts) is formed between at least a portion of the film and at least a portion of an adjacent, underlying material”
“bonded to a substrate with an alloyed layer” (‘650 patent)	This term should be construed as it was in <i>Gillette</i> and <i>Western Digital</i> : “Bonded to an adjacent, underlying material which includes a layer that is a mixture of a metal and one or more different metals or non-metallic elements”

(Dkt. No. 58, at 7.)

IV. CONSTRUCTION OF DISPUTED TERMS

Defendants submit that because diamond-like carbon (“DLC”) films were well-known at the time Plaintiffs prosecuted their patent applications, Plaintiffs only patented a particular method for making DLC films. (Dkt. No. 63, at 1.) Defendants argue that Plaintiffs are now attempting to read the claims so broadly as to encompass virtually all DLC films. (*Id.*)

Defendants emphasize the rejection and ultimate abandonment of United States Patent Application No. 07/602,155 (“the ‘155 Application”). (Dkt. No. 63, at 5.) United States Patent Application No. 08/042,104 (“the ‘104 Application”), which led to the ‘797 Patent, was a continuation-in-part of the ‘155 Application. The ‘650 Patent resulted from a divisional of the ‘104 Application. Defendants urge that the addition of Figure 6 and the terms “nanophase

diamond” and “nodules” in the ‘104 Application, together with assignment of the ‘104 Application to a different patent examiner, were critical factors in the patentees obtaining the patents-in-suit despite the PTO’s rejection of the ‘155 Application. (*Id.*, at 6.)

Even if the Court were in a position to judge the merit of PTO procedures or the caliber of particular patent examiners, the claim construction principles set forth by *Phillips* include no rubric for scrutinizing the PTO in such a fashion. *See* 415 F.3d 1303. Defendants present no authority that the assignment of different applications to different examiners is a factor for the Court to consider during claim construction. The Court does not consider it.

A. “nanophase diamond film” (‘797 Patent, Claims 1, 2 & 4; ‘650 Patent, Claims 1, 2 & 4)

Plaintiffs’ Proposal	Defs.’ Proposal	Prior Construction
“a film having nanometer-scale nodules of diamond-bonded carbon displaying characteristics similar to that of diamond” (<i>Gillette</i>)	“a film of an amorphous or ultra fine-grained diamond-like material that is substantially free of graphite and hydrogen, in the form of nanometer-sized, tightly packed nodules”	“a film having nanometer-scale nodules of diamond-bonded carbon displaying characteristics similar to that of diamond” (<i>Gillette</i> at 3-4 (Court found a lexicography in the specification)) “a film having nanometer-scale [packed] nodules of diamond-bonded carbon displaying characteristics similar to that of diamond” (<i>Western Digital</i> at 11-13 (Court again found a lexicography, but the Court’s Order set forth the construction in three places, one with the word “packed” and the other two without “packed”))

(Dkt. No. 65, P.R. 4-5(d) Joint Claim Construction Chart.)

(1) Preamble as a Limitation

At the January 30, 2013 hearing, Plaintiffs argued that the term “nanophase diamond film,” which appears in the preamble, is not a limitation but instead is merely descriptive of the limitations that appear in the body of the claim. Plaintiffs cited *Konami Corp. v. Roxor Games, Inc.*, 445 F. Supp. 2d 725, 731 (E.D. Tex. 2006), which held that the term “dance apparatus” in

the preamble was not a limitation because “[t]he body of the claims set forth a complete invention.” *Id.* (finding that the “preamble merely gives a descriptive name to the set of limitations in the body of the claim that completely set forth the invention”) (quoting *IMS Tech., Inc. v. Haas Automation, Inc.*, 206 F.3d 1422 (Fed. Cir. 2000)). Yet, “[w]hen limitations in the body of the claim rely upon and derive antecedent basis from the preamble, then the preamble may act as a necessary component of the claimed invention.” *Eaton Corp. v. Rockwell Int’l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003) (finding that “[w]hen the body of the claim refers to ‘said vehicle master clutch (8),’ and ‘said drive train,’ it is referring back to the particular clutch and the particular drive train previously described in the preamble”). Here like in *Eaton*, “said film” in the body of the claims refers back to “nanophase diamond film” in the preamble. The Court therefore expressly rejects Plaintiffs’ argument that the term “nanophase diamond film” is not a limitation of the claims.

(2) Lexicography

At the January 30, 2013 hearing, Plaintiffs and Defendants agreed that “nanophase diamond film” is a term coined by the inventor. The parties likewise agreed that the best way to interpret an inventor-coined term is to look for a definition in the specification. The parties further agreed that the specification contains a “lexicography,” that is, a definition. The parties disagreed on what that lexicography is.

Defendants submit that as the patentees prosecuted the ‘104 Application (the continuation-in-part application that led to the ‘797 Patent), their efforts to remedy the shortcomings of the ‘155 Application included replacing the term “diamond-like carbon” with

their newly-coined term “nanophase diamond film.” (Dkt. No. 63, at 5-6.) Defendants argue that this term is defined in the Background of the Invention of the patents-in-suit:

This invention relates to an amorphous or ultra fine-grained, diamond-like material that is substantially free of graphite and hydrogen, and is deposited in a film on a substrate in the form of nanometer-sized, tightly packed nodules of sp^3 -bonded carbon, hereinafter referred to as “nanophase diamond.”

(‘797 Patent at 1:16-21.)

Plaintiffs reply that the rejection of claims containing the term “diamond-like carbon” in a different patent application provides no basis upon which to limit the construction of the “inventor-coined term” “nanophase diamond” used in a later application. (Dkt. No. 64, at 3.) Plaintiffs also emphasize that their proposed construction includes “nanometer-scale nodules of diamond bonded carbon,” which Plaintiffs argue distinguish their patented invention from other types of DLC. (*Id.*)

An inventor is permitted to define the terms of his claims “[s]o long as the meaning of an expression is made reasonably clear and its use is consistent within a patent disclosure.” *Intellicall*, 952 F.2d at 1388 (quoting *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984)).

Although the Background of the Invention uses the seemingly definitional phrase “hereinafter referred to as,” the Summary of the Invention goes on to disclose that “an advantage of the present invention is its ability to produce nanophase diamond layers having *less than about 20% hydrogen (and preferably less than about 2% hydrogen)* uniformly deposited across a substrate and substantially void of macroscopic particles.” (‘797 Patent at 6:46-51.) This disclosure of “less than about 20% hydrogen” contrasts with the purportedly definitional disclosure of “diamond-like material that is substantially free of . . . hydrogen.” (*Id.*; *id.* at

1:16-21.) Defendants have responded that “less than about 20% hydrogen” *is* “substantially free” of hydrogen, but the Summary of the Invention goes on to disclose what Plaintiffs cited at the January 30, 2013 hearing as their proposed lexicography:

The term “nanophase diamond” refers to any type of structure having nanometer-scale nodules of diamond-bonded carbon displaying characteristics similar to that of diamond.

(*Id.* at 7:19-22.)

On balance, this inconsistency between column 1 and column 7 of the ‘797 Patent demonstrates that *neither* of the above-quoted passages relied upon by Defendants and Plaintiffs, respectively, amounts to a “reasonably clear,” “consistent” lexicography. *Intellicall*, 952 F.2d at 1388. Both sides’ proposals of a lexicography are therefore hereby expressly rejected.

(3) “substantially free of graphite”

Defendants rely upon disclosures that in the preferred embodiment, a film that is free of graphite is desirable and can be achieved using various techniques. (*See* Dkt. No. 63 at 8-9.) The patents-in-suit disclose, however, that a nanophase diamond film can contain graphite. (*See* ‘797 Patent at 4:42-43 (“Between the nodules is found an amorphous mixture of carbons and void.”).) Defendants’ attempt to import a graphite-free limitation from a disclosed embodiment is hereby expressly rejected.

(4) “substantially free of . . . hydrogen”

Defendants submit:

Plaintiffs contend that [Defendants’] proposed construction, including “substantially free of . . . hydrogen” is inconsistent and confusing when considered with the limitation “less than about 20% hydrogen” in the body of claim 1. (Pls. Br. at 15). [Defendants’] proposed construction is neither inconsistent nor confusing. Instead, it establishes the context for understanding the specific limitations recited in claim 1. [Defendants’] proposed construction

sets forth that a claimed “nanophase diamond film” must be “substantially free of . . . hydrogen.” The body of claim 1 then provides a specific amount – “less than about 20% hydrogen” – within the general framework. As [Defendants’] proposed construction gives the proper context for understanding the rest of the claim language, it is helpful for understanding the remainder of the claim language.

(Dkt. No. 63 at 9.)

On balance, despite Defendants’ argument that their proposal gives “proper context” for the “less than about 20% hydrogen” limitation, a better reading is that Defendants’ interpretation would render that limitation superfluous. Because the law disfavors a claim construction that renders other claim language superfluous, Defendants’ proposed “substantially free of . . . hydrogen” limitation is hereby expressly rejected. *See, e.g., Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950-51 (Fed. Cir. 2006) (“Claims are interpreted with an eye toward giving effect to all terms in the claim.”) (citations omitted).

(5) “nanometer-sized, tightly packed nodules”

Defendants rely upon the following disclosures in the Summary of the Invention:

The basic unit of construction of the nanophase diamond of the present invention is the sp^3 -bonded nodule. Typically, these nodules range in size from 100 to 1000 angstroms [(10 to 100 nanometers)] in diameter and contribute the properties of diamond found in the finished films.

* * *

Nanophase diamond is perhaps a limiting form of i-C.² Both materials are comprised of diamond nodules, but only in nanophase diamond have the nodules been reported to be densely packed throughout the volume of the film.

(’797 Patent at 4:27-31 & 4:44-48.) The specification further discloses:

² “i-C” is not defined in the patents-in-suit, but an article written by Plaintiffs refers to “i-C” as amorphous carbon that is produced from ionized precursors. (*See* Dkt. No. 63, Ex. C-11, C.B. Collins, et al., *Microstructural analysis of amorphous diamond, i-C, and amorphous carbon*, 72 J. Appl. Phys. 239, 239 (July 1992).)

The visual appearance of the film at the micron level is of tightly-packed, yet randomly ordered, diamond nodules.

* * *

The nanophase diamond films of the present invention are characterized by a very low average internal stress, on the order of 1 GPa or less. This is due to the tight packing of the nodules.

(*Id.* at 12:44-47 & 15:30-33.)

As noted by Plaintiffs' reply brief, the above-quoted disclosure in the specification that "[n]anophase diamond is *perhaps* a limiting form of i-C" (*id.* at 4:44-48 (emphasis added)) is equivocal and does not justify introducing a limitation that the nodules be tightly packed. (Dkt. No. 64, at 4.) Likewise, the above-quoted disclosure of "tight packing of the nodules" relates to a preferred embodiment. ('797 Patent at 15:30-33; *see* Dkt. No. 63, Ex. C-11, C.B. Collins, et al., *Microstructural analysis of amorphous diamond, i-C, and amorphous carbon*, 72 J. Appl. Phys. 239, 241 (July 1992) (noting that amorphous diamond³ has been prepared with "different efficiencies of packing" "between the grains" and "a variety of arrangements and packings of the nodules of the *sp*³-bonded carbon"). Finally, including the phrase "tightly packed" would render the disputed term vague, ambiguous, and potentially subjective.

On balance, Defendants' proposal to limit the claimed nanophase diamond film to the "tightly packed nodules" of the preferred embodiment is hereby expressly rejected.

(6) Additional Issues

Defendants urge that having replaced the term "diamond-like carbon" in the abandoned '155 Application with the term "nanophase diamond film" in the '104 Application, the patentees

³ The term "amorphous carbon" is a shortened form of the term "amorphous ceramic carbon." (Dkt. No. 63, Ex. C-17, C.B. Collins, et al., *Noncrystalline films with the chemistry, bonding, and properties of diamond*, 11 J. Vac. Sci. Tech. 1936, 1936 (Sept./Oct. 1993).)

should not be permitted to recapture all diamond-like films. (Dkt. No. 63, at 12-13 (citing *Elekta Instruments v. O.U.R. Scientific Int'l, Inc.*, 214 F.3d 1302, 1308 (Fed. Cir. 2000) (“Claims that have been narrowed in order to obtain issuance over the prior art cannot later be interpreted to cover that which was previously disclaimed during prosecution.”))).) Defendants also cite articles published by the named inventors, as well as the inventors’ deposition testimony. (Dkt. No. 63, at 11.)

Plaintiffs reply that “the term ‘nanophase diamond film’ is merely a descriptive introductory phrase that should not be confused with the claimed invention,” and “[t]he body of the claim specifies those additional features that must be present for a film to be a claimed nanophase diamond film.” (Dkt. No. 64, at 5.)

On balance, the change in terminology from one patent application to another does not warrant imposing limitations on the new term “nanophase diamond film.” Instead, the specific requirements for the claimed nanophase diamond film are set forth in the bodies of the claims. All that the term “nanophase diamond film,” by itself,” requires is that the film must contain nanosized nodules of sp^3 -bonded carbon (which *Gillette*, *Western Digital*, and the Abstract of the patents-in-suit have referred to as “diamond-bonded” carbon) and must have diamond-like characteristics.

Finally, Defendants submit that “Plaintiffs’ definition does not specify which or how many characteristics of the film would need to be similar to the characteristics of diamond in order to be covered by the claim, or to what degree those characteristics need to be ‘similar.’” (Dkt. No. 63, at 13.) The specification explains ranges of measurements pertaining to the desirable characteristics. (*See* ‘797 Patent at 4:64-67 (imaginary index of refraction), 13:21-25

(Newton's rings), 13:55-61 (real index of refraction), 15:15-29 (hardness), 15:30-40 (low average internal stress and low coefficient of friction) & Figs. 3-4 (indices of refraction).)

Because “mathematical precision” is not required, Defendants’ challenge in this regard is hereby expressly rejected. *Cf. Exxon Res. & Eng’g Co. v. U.S.*, 265 F.3d 1371, 1381 (Fed. Cir. 2001) (“[M]athematical precision is not required [for definiteness]—only a reasonable degree of particularity and definiteness.”).

In sum, the Court hereby construes **“nanophase diamond film”** to mean **“a film having nanometer-scale nodules of diamond-bonded carbon displaying characteristics similar to that of diamond.”**

B. “nodules” (‘797 Patent, Claims 1 & 2; ‘650 Patent, Claims 1 & 4)

Plaintiffs’ Proposal	Defendants’ Proposal	Prior Construction
“clusters of carbon atoms of rounded or irregular shape” (<i>Gillette; Western Digital</i>)	“particles, clusters, fine grains, or crystallites of carbon atoms separate and identifiable by transmission electron microscopy (TEM) of the nanophase diamond film”	“clusters of carbon atoms of rounded or irregular shape” (<i>Gillette</i> at 6; <i>Western Digital</i> at 8-11)

(Dkt. No. 65, P.R. 4-5(d) Joint Claim Construction Chart.)

Defendants argue that “[i]n order to be able to measure a diameter of a nodule to determine if its diameter comports with the claims, the nodules must be separate and identifiable.” (Dkt. No. 63, at 14.) At the January 30, 2013 hearing, Defendants argued that the limitations contained in their proposed construction are necessary to avoid the claims being invalid as indefinite.

Plaintiffs argue that “[t]he term ‘nodules’ is not so difficult to understand that it requires a lengthy laundry list of purported synonyms such as ‘[p]articles, clusters, fine grains, or

crystallites,’ particularly when the intrinsic evidence uses the simple term ‘clusters.’” (Dkt. No. 58, at 13.)

The specification discloses:

[I]t is understood that the nanophase diamond film comprises substantially dehydrogenated nodules of sp^3 -bonded carbon (*i.e., fine-grained clusters* having dimensions of 100-1000 angstroms and preferably less than 500 angstroms).

* * *

Properties of importance to the quality of an optical material include quantities such as a high index of refraction, a low coefficient for absorption of light, a smooth surface finish, and a *nodule or crystal size* smaller than a wavelength of the light of interest.

(’797 Patent at 6:63-68 & 12:54-59 (emphasis added).) Further, the Summary of the Invention discloses that “[b]etween the nodules is found an amorphous mixture of carbons and void,” so the nodules are separated from one another to some extent. (*Id.* at 4:42-43.) Finally, the only depiction of nodules is through transmission electron microscopy (“TEM”). (*See id.* at 4:48-50 & Fig. 6.)

As to the prosecution history, the abandoned ‘155 Application recited “clusters,” and those claims were rejected as unpatentable over prior art. (Dkt. No. 63, Ex. C-9, 1/16/1993 Office Action, at 4.) During prosecution of the ‘104 Application (which issued as the ‘797 Patent), the patentee argued:

In contrast to the face-centered cubic construction of the [prior art] films, the nodules comprising the film of the present invention lack coherent ordering, probably because they contain a random alternation of the cubic and hexagonal polytypes of diamond. With *electron diffraction* [(a technique used in, for example, transmission electron microscopy (TEM))], they appear amorphous. Between the nodules is found an amorphous mixture of carbons and void.

(*Id.*, Ex. C-14, 8/8/1994 Amendment, at 4 (emphasis added) (internal citations omitted).)

Defendants conclude that “nodules” must mean more than simply clusters, to wit, clusters that are “separate and identifiable by transmission electron microscopy (TEM) of the nanophase diamond film.” (Dkt. No. 63, at 16.)

Plaintiffs reply that transmission electron microscopy “is only one implementation of electron diffraction.” (Dkt. No. 64, at 7.)

As to the other evidence, Defendants cite Plaintiffs’ publications and deposition testimony, but none of this other cited evidence alters the significance of the above-discussed intrinsic evidence. (*See* Dkt. No. 63, at 18.) Further, Plaintiffs include with their reply a declaration by one of the inventors, Dr. Farzin Davanloo, explaining that the claimed nodules can be visualized by techniques other than transmission electron microscopy:

4. The nanophase diamond films patented in the Asserted Patents contain nodules of carbon bonded predominantly in three dimensional sp^3 bonds. These claimed nodules can be visualized by many techniques. These techniques include techniques that rely on electron diffraction, as well as other techniques that do not rely on electron diffraction[.] The techniques that do not rely on electron diffraction include atomic force microscopy, which uses a cantilever and probe to scan the sample’s surface directly.

(Dkt. No. 64, Ex. A, 12/17/2012 Davanloo Decl., at ¶ 4; *see* Dkt. No. 63, Ex. C-11, C.B. Collins, et al., *Microstructural analysis of amorphous diamond, i-C, and amorphous carbon*, 72 J. Appl. Phys. 239, 241 (July 1992) (contrasting TEM with the use of scanning tunneling microscopy (“STM”)); *see also* Dkt. No. 63, Ex. C-16, 1/20/2011 Davanloo dep., at 261:6-262:8 (contrasting TEM with STM and with atomic force microscopy (“ATM”)).)

Figure 6 is disclosed as being “a photograph of diamond nodules shown by transmission electron microscopy of a gold-coated replica of a film of nanophase diamond in accordance with the present invention” (‘797 Patent at 7:41-44). First, this language does not warrant limiting

“nodules” to the depicted embodiment. In other words, that the structure shown in Figure 6 is within the scope of the term “nodules” does *not* mean that the scope of the term “nodules” must be limited to Figure 6. *MBO Labs., Inc. v. Becton, Dickinson & Co.*, 474 F.3d 1323, 1333 (Fed. Cir. 2007) (noting that “patent coverage is not necessarily limited to inventions that look like the ones in the figures”). Second, Defendants argue that because Figure 6 is described as a “gold-coated replica” rather than as an actual nanophase diamond film, Figure 6 should not be relied upon when construing the term “nodules.” Yet, Figure 6 is part of the patents-in-suit and is described as “show[ing] the nodules of the nanophase diamond film.” (‘797 Patent at 12:41-43.) Figure 6 may therefore properly be considered as part of the context in which the patents-in-suit use the term “nodules.”

In sum, neither the specification nor the prosecution history contain any disclaimer or definition that would justify construing the generic term “nodules” to require that clusters of atoms must be “identifiable by transmission electron microscopy (TEM).” Defendants’ proposed limitation in that regard is hereby expressly rejected.

Further, Defendants’ proposal of “separate” could be interpreted to require that nodules cannot be in contact with one another. The disclosure that graphite and voids may lie between nodules (*see* ‘797 Patent at 4:42-43) in no way implies that nodules must be completely separate from one another, that is, that the nodules cannot touch one another. Defendants persuasively argued at the January 30, 2013 hearing, however, that the word “clusters,” if used without any qualification, would permit Plaintiffs to identify any group of atoms as a “cluster” even if the cluster at issue were part of a larger unitary “clump,” so to speak. Such an interpretation, which would read out the “nodule” limitation entirely, must be rejected. Plaintiffs appear to agree, both

in briefing and through deposition testimony, that “nodule” connotes some degree of separateness:

The space between the nodules can contain sp^2 bonded carbon, can be a void containing nothing, or can contain a mixture of the two. *See id.* at Col. 4, ll. 42-43; Col. 7, ll. 11-22. The nodules within the claimed nanophase diamond film are significant, as they give the claimed films both flexibility and strength, *comparable to a cobblestone street.* *See id.* at Col. 15, ll. 24-29.

(Dkt. No. 58, at 3-4 (emphasis added).)

Q. What is the smallest number of carbon atoms that you could have and still have a nodule?

A. I’ve answered this question before.

Q. Number of carbon atoms?

A. I think I answered this before. I said that there is -- there is -- there should be a cluster form. *A separate cluster should be formed*, and that cluster cannot be two, three atoms. Maybe there would be 10 or 20 atoms. I cannot put you a number there. The cluster has to be formed that is disclosed in our patents.

(Dkt. No. 63, Ex. C-15, 1/19/2011 Davanloo dep., at 216:3-12 (emphasis added).)

Thus, while Defendants’ proposal of “separate” is expressly rejected so as to avoid any requirement of complete separation between the clusters, the Court’s construction should nonetheless clarify that the clusters are “distinct.”

The Court therefore hereby construes “**nodules**” to mean “**discrete clusters of carbon atoms of rounded or irregular shape.**”

C. “predominantly in three-dimensional sp³ bonds” (‘797 Patent, Claim 1; ‘650 Patent, Claims 1 & 4)

Plaintiffs’	Defendants’	Prior Construction
“approximately 95% or more of the bonds between the carbon atoms in each nodule are three dimensional sp ³ bonds” (<i>Gillette</i>)	“95% or more of the bonds between the carbon atoms in each nodule are three dimensional sp ³ bonds”	<i>Gillette</i> construed the larger term “nodules of carbon bonded predominantly in three dimensional sp ³ bonds” to mean: “clusters of carbon atoms of rounded or irregular shape wherein approximately 95% or more of the bonds between the carbon atoms in each <u>cluster</u> are three dimensional sp ³ bonds” <i>Gillette</i> at 4-6 (underlining added). In <i>Western Digital</i> , the parties agreed to construe “bonded predominantly in three dimensional sp ³ bonds” to mean “approximately 95% or more of the bonds between the carbon atoms in each <u>nodule</u> are three dimensional sp ³ bonds.” <i>Western Digital</i> at 7 (underlining added).

(Dkt. No. 65, P.R. 4-5(d) Joint Claim Construction Chart.)

Defendants argue that “there is absolutely no support for the inclusion of the word ‘approximately’ in the definition,” such as any words like “about” or “generally” in the claims or any reference to “approximately” in the specification. (Dkt. No. 63, at 21-22.)

Gillette reached the “approximately 95%” construction based on the constituent term “predominantly” and the various disclosures in the specification. *See Gillette* at 4-6. Defendants now rely upon “predominantly” as support for the “95%” limitation, which the parties have agreed upon, while at the same time rejecting that “95%” is disclosed as an estimate rather than as a definitively determinable figure.

As Plaintiffs argue, “[t]he construction’s inclusion of ‘approximately’ gives proper effect to this description of the *estimation* of sp² bonding suggested by the described measurements.” (Dkt. No. 58, at 16.) The specification discloses that “*estimates* supported by measurements of

mass densities and soft x-ray ($K\alpha$) emission spectra *suggest that* the sp^2 content within the nodules is less than 5% and perhaps even as low as 2%, indicating a ‘diamond-like’ material.” (‘797 Patent at 4:38-42 (emphasis added).) This disclosure of “estimates” provides sufficient guidance for a person of ordinary skill in the art, but these are estimates nonetheless. *Cf. Invitrogen Corp. v. Biocrest Mfg., L.P.*, 424 F.3d 1374, 1384 (Fed. Cir. 2005) (“[A] patentee need not define his invention with mathematical precision in order to comply with the definiteness requirement.”); *Exxon*, 265 F.3d at 1381 (Fed. Cir. 2001) (“[M]athematical precision is not required [for definiteness]—only a reasonable degree of particularity and definiteness.”). Because the sp^3 content cannot be measured directly and instead is “suggest[ed]” by “estimates” based on other material properties (‘797 Patent at 4:38-42), here as in *Gillette* the word “approximately” should be included in the construction.

Finally, Plaintiffs’ journal article cited by Defendants does not add anything of relevance to what is already disclosed in the specification. (Dkt. No. 63, at 22 (citing Ex. C-19, C.B. Collins et al., *The Bonding of Protective Films of Amorphous Diamond to Titanium*, 71 J. App. Phys. 3260, 3269 (Apr. 1992) (explaining that “the sp^2 content within the nodules is less than 5% and perhaps even as low as 2%”))).

The Court therefore hereby construes **“predominantly in three-dimensional sp^3 bonds”** to mean **“approximately 95% or more of the bonds between the carbon atoms in each nodule are three dimensional sp^3 bonds.”**

D. “an optical quality capable of providing a visual appearance of Newton’s rings of interference” (‘797 Patent, Claim 4; ‘650 Patent, Claim 4)

Plaintiffs’ Proposal	Defendants’ Proposal	Prior Construction
“optical characteristics such that the material is capable of exhibiting visible dark, bright, and/or colored rings or lines” (same as <i>Gillette</i> and <i>Western Digital</i>)	Plain and ordinary meaning	“optical characteristics such that the material is capable of exhibiting visible dark, bright, and/or colored rings or lines” (<i>Gillette</i> at 6-7; <i>Western Digital</i> at 14-16)

(Dkt. No. 65, P.R. 4-5(d) Joint Claim Construction Chart.)

Here as in *Western Digital*, “[t]he parties do not dispute that the plain and ordinary meaning of ‘capable of providing a visual appearance of Newton’s rings of interference’ is ‘capable of exhibiting visible dark, bright and/or colored rings or lines.’” (Dkt. No. 63, at 24; *Western Digital* at 15 (“The parties do not dispute that Newton’s rings are understood by those of ordinary skill in the art to be a series of light, dark, and/or colored lines or rings created as results of interference patterns.”).)

Defendants urge, however, that the claims recite that “said film,” not merely the material, has the requisite optical quality. (Dkt. No. 63, at 25.) At the January 30, 2013 hearing, the parties further characterized their dispute as being centered on the meaning of the phrase “capable of.” The issue is whether the claims require that: (a) the nanophase diamond material that makes up the claimed film is capable of being configured to show Newton’s rings by modifying, for example, the film’s shape, thickness, or surface finish, as Plaintiffs argue; or (b) a particular film having a particular shape, thickness, or surface finish, for example, is capable of showing Newton’s rings, as Defendants argue.

Thus, in Plaintiffs view, “capable of” is a property of the material that allows for manipulating the characteristics of the film that is made up of the material. In other words, even if Newton’s rings do not appear for a particular film, the material that makes up the film might nonetheless be “capable of” displaying Newton’s rings under other circumstances.

According to Defendants, by contrast, “capable of” is a property of a particular film and does not refer to reconfiguring the material that makes up the film. Thus, under Defendants’ interpretation, “capable of” refers to other factors, for example, the various environmental factors that affect whether Newton’s rings appear, such as the position of the light source, the type of light source, the viewing angle, and so forth.⁴

The discussion of this disputed term in *Gillette* is reproduced here:

The plaintiffs urge that the disputed phrase should be construed to mean “optical characteristics such that the material is capable of exhibiting visible dark, bright, and/or colored rings or lines.” The plaintiffs submit that the specification and the prosecution history teach that the appearance of these interference patterns arises from the internal reflection of light within the films. The defendant proposes that the disputed phrase should be construed to mean that “the film taken as is at its actual thickness and on its actual substrate has optical characteristics such that the film is capable of exhibiting multiple alternating, visible dark and bright (or colored) interference rings or lines.” The defendant contends that a film is not capable of providing a visual appearance of Newton’s rings of interference if that film cannot display bands of interference colors at the film’s actual thickness and on the film’s actual substrate.

The court is persuaded that the plaintiffs are correct. The defendant does not provide any support for the limitations it attempts to read into the claims. The court therefore adopts the plaintiffs’ construction of the disputed phrase. Accordingly, the court construes “an optical quality capable of providing a visual appearance of Newtons’ [sic] rings of interference” to mean “optical characteristics such that the material is capable of exhibiting visible dark, bright, and/or colored rings or lines.”

⁴ At the January 30, 2013 hearing, when questioned by the Court, Plaintiffs acknowledged that environmental factors like these have a role in whether Newton’s rings appear.

Gillette at 6-7.

In *Western Digital*, the defendants argued that this disputed term rendered the claims indefinite because the claims failed to identify the required sample thickness needed to test for the appearance of Newton's rings. *Western Digital* at 14. The defendants explained, as the Court characterized it, that "any material can have interference effects if it is sliced thin enough, including non-optical films such as metal films." *Id.* at 15. The Court found that "[a]s argued by Plaintiffs, the claims require an optical quality that would not be found in materials such as coal or metal, regardless of how thinly they are sliced." *Id.* The Court concluded that "the claims do not require a specific thickness of the film as it relates to this element." *Id.* at 16.

Thus, *Gillette* provided no substantive analysis for this Court to consider, and *Western Digital* was focused on issues of indefiniteness, not on whether the disputed term should be evaluated as to a material in general or as to a particular film.

Claim 4 of the '797 Patent is representative and recites:

4. The nanophase diamond film of claim 1, wherein said film has an optical quality capable of providing a visual appearance of Newtons' [*sic*] rings of interference.

The Abstract of the patents-in-suit states, in relevant part (emphasis added):

The nanophase diamond *films* of the present invention are also characterized by a low coefficient of friction, by low average internal stress, and by an optical quality capable of providing a visual appearance of Newton's rings of interference.

Similarly, the specification discloses that the appearance of Newton's rings is not a feature of the nanophase material in general but rather is a feature of a "layer" or "film" of material, such as "a film of optical material":

The optical quality of the nanophase diamond *layer* is particularly significant in that it is capable of providing a visual appearance of Newton's rings of interference. *The occurrence of Newton's rings in a film of optical material* can be an especially useful means for distinguishing that material from other so-called optical quality, or "diamond-like" materials. Properties of importance to the quality of an optical material include quantities such as a high index of refraction, a low coefficient for absorption of light, a smooth surface finish, and a nodule or crystal size smaller than a wavelength of the light of interest. Each of these properties is a necessary but not sufficient condition to support the appearance of Newtons' [sic] rings. Thus, while two samples might have the same indices of refraction, or might both be described as optically smooth, they may nevertheless be distinguishably different on the basis of other properties just listed. Therefore, the appearance of Newton's rings is a particularly effective test for the simultaneous occurrence of optimal values of all of the figures of merit for an optical material.

('797 Patent at 12:48-68 (emphasis added).) The specification goes on to explain that "the nanophase diamond *film* of the present invention *retains optical characteristics* essential for producing Newton's rings *even for thickness greater than 2 microns.*" (*Id.* at 13:21-25 (emphasis added).) This use of the word "retains" suggests that the requisite optical characteristics are of the film, not of the material in general.

During prosecution of the '155 Application, from which the patents-in-suit claim priority, Plaintiffs argued that "the present application claims a carbon *film* being greater than 2 microns, yet being of sufficient *optical quality* to display Newton's Rings." (Dkt. No. 63, Ex. C-20, 2/3/1993 Amendment After Final Rejection and Remarks, at 10 (emphasis added).) The patentee thus referred to the appearance of Newton's rings in the context of a particular thickness, which is a property of a layer or film rather than of a material in general. During a subsequent appeal to the Board of Patent Appeals and Interferences, Plaintiffs argued that "[t]his potential [as an excellent protective coating] is further enhanced by the superior *optical quality of the claimed film*, which is capable of displaying Newton's rings of interference." (*Id.*, Ex. C-21, 7/22/1993

Appeal Brief at 3 (emphasis added); *see id.* at 8 (referring to a claim “wherein the *layer* has an optical quality capable of providing a visual appearance of Newton’s rings of interference”) (emphasis added).⁵

As to the prosecution of the ’104 Application (which issued as the ’797 Patent), Plaintiffs again reaffirmed that “[t]he *film* of the present invention is also capable of supporting the visual appearance of Newton’s rings of interference.” (*Id.*, Ex. C-14, 8/8/1994 Amendment, at 6 (emphasis added).)

On balance, based on the above-quoted portions of the specification and the prosecution history, as well as the arguments of counsel at the January 30, 2013 hearing, the Court departs from *Gillette* and *Western Digital* and finds, as Defendants argue, that the claimed optical characteristics are not of the nanophase diamond material in general but rather are of the film recited in the claims. Thus, it is irrelevant whether the nanophase diamond material that the film is composed of could be configured in such a way that Newton’s rings would appear. Instead, the claims require that Newton’s rings appear in a particular nanophase diamond film, as formed in a particular shape, with a particular thickness, with a particular surface finish, and so forth.⁶

Contrary to Plaintiffs’ argument at the January 30, 2013 hearing, this finding does not read the

⁵ The Board of Patent Appeals and Interferences affirmed the Examiner’s rejection of the claims of the ’155 Application, finding that Plaintiffs failed to meet their burden to submit evidence that optical quality providing a visual appearance of Newton’s rings of interference was not inherent in the “Deutschman” reference, United States Patent No. 4,992,298. (*See* Dkt. No. 63, Ex. C-5, 7/10/1996 Decision on Appeal, at 6-7.) Plaintiffs then abandoned the ’155 Application. (*See* Dkt. No. 63, Ex. C-6, 10/21/1996 Notice of Abandonment.)

⁶ At the January 30, 2013 hearing, Defendants also urged that the film must be evaluated as it resides on a particular substrate, but not all of the claims recite a substrate, and neither the specification nor the prosecution history definitively rule out the existence of a free-standing nanophase diamond film. The Court’s construction of the “Newton’s ring” term is therefore agnostic about whether the film being evaluated is attached to a substrate.

phrase “optical quality” out of the claims but instead clarifies that, as expressly claimed, the “optical quality” is of “said film,” not of the material in general.

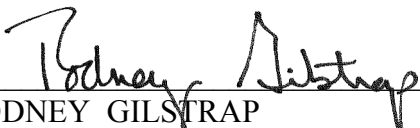
The Court therefore hereby construes **“an optical quality capable of providing a visual appearance of Newton’s rings of interference”** to mean **“optical characteristics such that the film is capable of exhibiting visible dark, bright, and/or colored rings or lines.”**

V. CONCLUSION

The Court adopts the constructions set forth in this opinion for the disputed terms of the patents-in-suit. The parties are ordered that they may not refer, directly or indirectly, to each other’s claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual definitions adopted by the Court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the definitions adopted by the Court.

Within thirty (30) days of the issuance of this Memorandum Opinion and Order, the parties are hereby ORDERED, in good faith, to mediate this case with the mediator agreed upon by the parties. As a part of such mediation, each party shall appear by counsel and by at least one corporate officer possessing sufficient authority and control to unilaterally make binding decisions for the corporation adequate to address any good faith offer or counteroffer of settlement that might arise during such mediation. Failure to do so shall be deemed by the Court as a failure to mediate in good faith and may subject that party to such sanctions as the Court deems appropriate.

So ORDERED and SIGNED this 5th day of February, 2013.



RODNEY GILSTRAP
UNITED STATES DISTRICT JUDGE